over United States Patent No. 6,211,010 to Lee et al. ("the Lee reference") in view of United States Patent No. 6,077,451 to Takenaka et al. ("the Takenaka reference") and further in view of United States Patent No. 6,432,838 to Choi ("the Choi reference").

Claim 31 recites:

> A method for etching, comprising:
> exposing a silicon element to a first heat treatment in a vacuum at a first elevated temperature;
> selectively etching the silicon element with a gaseous etching medium and forming gaseous reactive products, wherein the gaseous etching medium comprises chlorine trifluoride; and
> exposing, subsequent to the selective etching, the silicon element to a second heat treatment in a vacuum at a second elevated temperature.

Contrary to the assertions in the Office Action, the Lee reference does not disclose "exposing, subsequent to the selective etching, the silicon element to a heat treatment in a vacuum at an elevated temperature." Specifically, in Figure 5, the Lee reference discloses that the vacuum (noted in pressure [Torr]) applied to the chamber is removed after the In-situ Pre-cleaning and Pump steps. The subsequent Venting, Seed Layer, and Heat Treatment steps are not performed in a vacuum. While the Examiner relies on step 407 of Figure 4 of Lee for teaching "heat treatment in a vacuum," neither Figure 4 nor the description of step 407 implies that a vacuum is generated prior to the heat treatment. Rather, the process chamber is ventilated prior to step 407, i.e. in step 406 ("After the growth reactor is ventilated to remove the cleaning gases therefrom, a seeded layer is formed on the polysilicon (step 406)." (Lee, column 3, lines 58-60). The Takenaka and Choi references also fail to disclose the step of a heat treatment in a vacuum subsequent to the etching process.

Furthermore, as a noted by the Examiner, the Lee and Takenaka references fail to disclose "exposing a silicon element to a first heat treatment in a vacuum at a first elevated temperature." The Examiner cites a passage from the Choi reference as describing this step. However, this passage discloses that the etching step is performed in a vacuum, not the heat treatment. According to the Choi reference:

> etching at the portions where plasma cannot reach ... [illegible] has the advantage that it is highly unlikely to generate particles that could

> contaminate the wafer surface. In use ClF_3 is generally diluted to a concentration of 20±5 volume % with an inert gas such as N_2. While the lower pressure in the process chamber is good for the uniform etch for the layer inside the chamber, the higher mixing rate of etch gas is good for increasing the etch rate. It is preferable to heat the process chamber to a temperature higher than the boiling point of the ClF_3, prior to the introduction of ClF_3 and preferably higher than 400° C. (Choi, col. 5, ll. 17-30).

Thus, the Choi reference discloses that the heating process is performed prior to the introduction of the ClF_3. It does not disclose that this heating processing is carried out in a vacuum. The description of the lower pressure inside the process chamber describes the etching nature of the ClF_3. The ClF_3 is introduced into the chamber after the heating process. While a vacuum is present during the ClF_3 etching process, there is no disclosure that a vacuum is present during any other process including the pre-heating of the chamber. Therefore, the Choi reference does not teach or suggest "exposing a silicon element to a first heat treatment in a vacuum at a first elevated temperature."

In regard to Claim 33, neither the Lee nor the Choi reference discloses that the heat treatment is accomplished in a vacuum lock chamber. According to the Lee reference, the only vacuum applied occurs during the etching process in the process chamber, not in a vacuum lock chamber. (*See* Lee, Figure 5.) Also, the Choi reference, as discussed above, only describes a vacuum during the etching process occurring in the process chamber, but not in the vacuum lock chamber. Therefore, neither the Lee nor the Choi reference discloses that "at least one of the first and the second heat treatment is accomplished in a vacuum lock chamber," as recited in Claim 33.

Since the Lee, Takenaka, and Choi references fail to disclose each and every feature of Claim 31, the Lee, Takenaka, and Choi references do not render Claim 31 or dependent Claim 33 obvious under 35 U.S.C. §103(a). It is, therefore, respectfully requested that this rejection be withdrawn.

Claim 35, which depends from Claim 31, stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee, Takenaka and Choi in view of U.S. Patent No. 6,136,137 to Farnworth ("Farnworth"). Since Farnworth fails to remedy the deficiencies of

CONCLUSION

In light of the foregoing, Applicants respectfully submit that all of the pending claims are in condition for allowance. Prompt issuance of a notice of allowance of the present application is therefore requested.

Respectfully submitted,

Dated: June 26, 2003

By: [signature] (by [signature] R. No. 36,197)

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AMENDMENT VERSION WITH MARKINGS

In the Claims:

Claims 32 and 34 have been amended as follows:

32. (Amended) [The method as recited in Claim 31,] A method for etching, comprising:

exposing a silicon element to a first heat treatment in a vacuum at a first elevated temperature;

selectively etching the silicon element with a gaseous etching medium and forming gaseous reactive products, wherein the gaseous etching medium comprises chlorine trifluoride; and

exposing, subsequent to the selective etching, the silicon element to a second heat treatment in a vacuum at a second elevated temperature;

wherein at least one of the first and the second heat treatment is implemented with a radiant heating at a pressure of less than 0.1 μbar.

34. (Amended) [The method as recited in Claim 33, further comprising:] A method for etching, comprising:

exposing a silicon element to a first heat treatment in a vacuum at a first elevated temperature;

selectively etching the silicon element with a gaseous etching medium and forming gaseous reactive products, wherein the gaseous etching medium comprises chlorine trifluoride;

exposing, subsequent to the selective etching, the silicon element to a second heat treatment in a vacuum at a second elevated temperature, wherein at least one of the first and the second heat treatment is accomplished in a vacuum lock chamber;

[illegible] the first heat treatment, the silicon element from the

transferring, prior to the second heat treatment, the silicon element from the reaction chamber to the vacuum lock chamber.